CalRecycle E-Waste Product Selection Criteria
THIS DOCUMENT IS FOR DISCUSSION PURPOSES ONLY

	Product	Current Management	Toxicity levels	Ease of Processing	Prevalence in Waste Stream	Trends	Material Recovery Value	Overall Staff Assessment
Computer Related Electronics	**Computer CPU**	Strong resale markets, especially for used devices from business	The CPU contains toxic substances, lead in circuit boards. Metal plates and housings may contain chromium. Motherboards and connectors often contain beryllium. Cadmium is commonly found in chip resistors, semi-conductors, infrared detectors, stabilizers, cables and wires. Circuit boards, switches and relays contain mercury as well chromium. Brominated flame retardants are used in many components, including circuit boards and plastic casings. (CHRON Small Business: http://smallbusiness.chron.com/toxic-components-computers-monitors-69693.html)	Hand disassembly (e.g., battery, Hg lamps); degree of disassembly or component recovery will vary with organization based on their business model; Shred and sort	0.1% of waste stream (CA Waste Char Study; definitions slightly different); " Computer-Related Electronics". High quantity per local government input.	Steady; units steady or increasing, while weight is declining	Market value for common and precious metals; medium to high	**MEDIUM** Currently reuse value or commodity revenues cover the proper collection and processing but margins are lower. Declining weight of newer products, miniaturization of components and/or substitution of materials will negatively impact revenues. Requires same collection and recycling infrastructure as CEW material.
	Organic LED	Similar to CED/LCD (non-CRT) devices, even mistakenly claimed at times	Low	Difficult		Increasing	Decreasing	**HIGH** Already comes into HHW and e-waste collection system; convenient for consumer to discard with other e-waste. Testing protocol too burdensome to be practical for processors. Requires same collection and recycling infrastructure as CEW material.
	Printer/Copiers/Faxes/ Scanners	Voluntary manufacturer takeback program	May contain lead, cadmium, copper, and chromium; designated as U-waste	Hand disassembly (e.g., Hg lamps and batteries); shred		Steady	Very low (unused blank paper has more value than printer per recyclers)	**HIGH** Voluntary programs insufficient for amount generated and usually focus on collection rather than processing with little oversight of downstream management. Backlight/lamp/battery/ink cartridge are the concern. Definitional challenges. Lifespan of products poor/planned obsolescence.
	Printer Ink	Voluntary takeback programs	MSDS shows moderate to serious risk for health and flammability			Steady		
	Keyboard/ Mouse/Computer Peripherals	HHW/landfill	7.2% of devices tested above threshold limits for bromine	Hand disassembly hazardous materials (e.g., batteries); shred			Little to no value; metal very small portion and large number of low-end mixed plastics	**MEDIUM** A material stream that is hard to target effectively and is not always hazardous. Material comes along with CEW. Requires same collection and recycling infrastructure as CEW material.
Other Small Electronics	**Non-CEW DVD/VCR Players and Peripherals**	HHW/landfill	Analytical data for suggests hazardous levels of copper, lead, nickel, and/or antimony; circuit boards and lasers may contain toxic materials	Information not available	information not readily available	Decreasing	Little to no value; metal very small portion and large number of low-end mixed plastics	**MEDIUM** Material stream trending down, likely not to remain a prevalent waste stream in future. Requires same collection and recycling infrastructure as CEW material.
	Wearables (smartwatch, Fitbit)	Information not available	NA	NA	information not readily available	Increasing	Little to no value for mixed plastics	**LOW** Will become waste in future. Monitor. Likely to come in mixed loads with other non-covered e-waste and would be difficult to separate between the two. Risk of hoarding; challenging to collect them.
	Cell phones	Directly recycled, reuse market, or in storage; has existing state law	NA	NA	NA	NA	Market value for common and precious metals	**LOW** Mandatory retail takeback already in place, high reuse value.
	Cameras	Information not available	NA	NA	information not readily available	Decreasing	Low	**LOW** Declining market due to cell phones integrating these functions.
	GPS		NA	NA	information not readily available			
	E-readers	Thrift stores, HHW/landfill	NA	NA	information not readily available	Steady	information not readily available	**MEDIUM** Material comes along with CEW. Requires same collection and recycling infrastructure as CEW material.
	Game systems	Re-sale HHW/landfill	Printed circuit boards, metals	Hand disassembly (e.g., battery removal); shred	information not readily available	Steady, but technology changes frequently	Small amount of metal; little to no value for mixed plastics	**MEDIUM** Related to keyboard/mouse/computer peripherals

* NA cells indicate that the product is considered a low priority (e.g.cell phones).

Product		Current Management	Toxicity levels	Ease of Processing	Prevalence in Waste Stream	Trends	Material Recovery Value	Overall Staff Assessment
Small Household Appliances	**Vacuum cleaners, microwaves, toasters**	Secondary market through both direct reuse and refurbishment through warranty programs	Plastics - possible toxicity issues in plasticizers, phthalates	Hand-disassembly for hazardous material; shred	0.3% (CA Waste Char Study; definitions slightly different). "Brown Goods" category; Vacuum cleaners problematic waste in HHW stream Per ESJPA	Increasing (vacuum cleaners 3% increase)	Little to no value.	**MEDIUM+** Since small appliance life spans have been cut in half, end of life management has become further burdened. Requires same collection and recycling infrastructure as CEW material.
	Personal care (hair dryer, electric toothbrush, etc.)	HHW/landfill	Plastics - possible toxicity issues in plasticizers, phthalates	information not readily available		Steady	Low	**MEDIUM** Less weight than other small household appliances and primary concern is the cord.
Large Household Appliances	**Refrigerator, Washer/Dryer, Dishwasher**	White goods retail takeback	CFC, HFC, mercury	Recyclers remove hazardous material and recycle Recyclers remove hazardous material and recycle	information not readily available	Steady	Medium	**LOW** Existing separate collection and recycling infrastructure in place is sufficient.
Electric Car Battery	**Electric Car Battery**	Auto Recyclers and Dismantlers / Recycling Facilities	NiMH=Nickel (harmful to human health in high doses, group 1 or 2B); Li-ion=Cobalt (toxic in high exposures - Group 2B, decreasing use due to cost). Lithium may be toxic to humans with prolonged exposure.	Hydrometallurgy & Pyro metallurgy	341,000 in 2020 1,273,000 in 2030 Reaching end of first life, but given size and current commodity value, probably not in waste stream.	Increasing	High value (nickel, cobalt); battery designs changing to contain less-valuable materials; concerns for economics of future recycling	**LOW** Will become waste in future. Likely managed by industry. Monitor.
Solar Panels	**Photo Voltaic Modules**	Evolving recycling techniques relate to rapid advances in the technology. Manufacturers want to recycle their own panels, not comingle with other brands with different specs	Manufacturing process uses dangerous chemicals/procedures (elsewhere) Concerning toxics in products at end of life include: Cadmium, Hexavalent chromium coatings, Arsenic, Copper, Selenium	Disassemble and dismantling; Separation	2% breakage/malfunction rate currently. New product and waste stream will kick into high gear in 2030s.	Increasing Not only large scale commercial products, but offerings at the residential level. Longer lifespans, with some 25 years lifespan guarantees (https://www.enfsolar.com/directory/panel);	Can be positive; Glass over 90%, challenging end-use markets; Reduction in material use	**MEDIUM+** Large expansion of product occurring means increased future waste stream. Many manufacturers of PV panels are no longer in business, so orphan material (where the original manufacturer cannot be identified or is no longer in business) needs to be addressed. Likely to require dedicated collection and recycling infrastructure to manage the various materials included in waste products.
Commercial & Medical Devices	**Retail Register screens, Bowling Alley terminals, etc. Hospital/Medical Devices**	Sometimes found in the CEW payment system material.	information not readily available	information not readily available	information not readily available	Increasing	information not readily available	**LOW** Some jurisdictions have small business clauses (50 or less employees) that cover the cost to properly manage commercial devices. Possible imbalance between total weight of device and the much smaller weight of the actual component of concern in the device. If the component is removed, it may fall under one of the other covered categories (e.g. LCD monitor from medical device would become CEW per current CEW definition.) Medical devices have health and safety concerns.
Toys, Leisure & Sporting Equipment	**Toys with batteries**	Thrift stores/landfill	Batteries should be taken out prior to disposal. (some are imbedded)	Dismantled by hand, shredded, or landfilled whole.	information not readily available	Steady	None	**LOW** Category not associated with e-waste by consumers. Probably requires a different infrastructure focused on managing batteries.
	Elliptical and Cardio Machines		PVC on power cords may have small amounts of lead.		information not readily available	information not readily available		
Household Tools	**Drills, Electric Saws, Leaf Blowers**	Thrift stores/landfill	Information not available	Dismantled by hand, shredded, or landfilled whole.	information not readily available	An uptick in cordless (re-chargeable batteries) items are being sold over corded ones.		
	Data Sources:	NCER The Electronics Recycling Landscape 2016; CA waste characterization; US EPA; Miller 2015; Euromonitor International						

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